

This listing of claims will replace all prior versions, and listings, of claims in the application:

1   Claim 1 (original): A method for determining the presence or  
2   concentration of a substance in a medium, the method comprising:  
3       a) providing a sensor in the medium, wherein the sensor  
4       includes at least one optical carrier and a microsphere  
5       having a surface including receptors for the substance,  
6       wherein the receptors are provided substantially at a belt  
7       surface area including an equator of the microsphere, and  
8       wherein surface areas of the microsphere other than the  
9       belt surface area are substantially free of receptors, each  
10      of the at least one optical carrier being coupled with the  
11      microsphere;  
12      b) applying a light source to one of the at least one  
13      optical carriers of the sensor;  
14      c) detecting light from one of the at least one optical  
15      carriers of the sensor; and  
16      d) determining a presence or concentration of the  
17      substance based on a property of the detected light,  
18      wherein the property is based on a shift in resonance of  
19      the microsphere.

1   Claim 2 (currently amended): The method of claim 1 wherein the  
2   light source emits light at a wavelength  $\lambda$ , wherein the  
3   microsphere has a radius  $R$  and a refractive index  $n$ , and wherein  
4   an arclength width of the belt is substantially the square root  
5   of  $R\lambda/2\pi n$ .

1   Claim 3 (original): The method of claim 1 wherein the  
2   microsphere is formed of a material having an index of  
3   refraction in water of approximately 1.7.

1   Claim 4 (original): The method of claim 1 wherein the  
2   microsphere has a radius in a range of 3.6-10  $\mu\text{m}$ .

1   Claim 5 (original): The method of claim 1 wherein each of the  
2   at least one optical carriers of the sensor are optically  
3   coupled with the microsphere at the equator.

1   Claim 6 (original): The method of claim 1 wherein the  
2   microsphere is formed of amorphous sapphire.

1   Claim 7 (original): The method of claim 1 wherein light source  
2   is controlled to emit light in the blue spectrum.

1   Claim 8 (original): The method of claim 7 wherein light source  
2   is controlled to emit light at about 400 nm.

1   Claim 9 (original): The method of claim 1 wherein the shift in  
2   resonance of the microsphere is detectable when any of the  
3   receptors in the belt surface area capture a single molecule  
4   having a mass of about 200,000 Da.

1   Claim 10 (original): A system for determining the presence or  
2   concentration of a substance in a medium, the system comprising:

3                 a) a sensor, for immersion in the medium, the  
4                 sensor including  
5                         i) at least one optical carrier, and  
6                         ii) a microsphere having a surface  
7                 including receptors for the substance, wherein the  
8                 receptors are provided substantially at a belt surface  
9                 area including an equator of the microsphere, and  
10                 wherein surface areas of the microsphere other than  
11                 the belt surface area are substantially free of  
12                 receptors, each of the at least one optical carrier  
13                 being coupled with the microsphere;

14                 b) a light source for applying light to one of  
15                 the at least one optical carriers of the sensor;

16                 c) a detector for detecting light from one of

17       the at least one optical carriers of the sensor; and  
18                   d) means for determining a presence or  
19       concentration of the substance based on a property of the  
20       detected light, wherein the property is based on a shift in  
21       resonance of the microsphere.

1       Claim 11 (currently amended): The system of claim 10 wherein  
2       the light source emits light at a wavelength  $\lambda$ , wherein the  
3       microsphere has a radius R and a refractive index n, and wherein  
4       an arclength width of the belt is substantially the square root  
5       of  $R\lambda/2\pi n$ .

1       Claim 12 (original): The system of claim 10 wherein the  
2       microsphere is formed of a material having an index of  
3       refraction in water of approximately 1.7.

1       Claim 13 (original): The system of claim 10 wherein the  
2       microsphere has a radius in a range of 3.6-10  $\mu\text{m}$ .

1       Claim 14 (original): The system of claim 10 wherein each of the  
2       at least one optical carriers of the sensor are optically  
3       coupled with the microsphere at the equator.

1       Claim 15 (original): The system of claim 10 wherein the  
2       microsphere is formed of amorphous sapphire.

1       Claim 16 (currently amended): The system of claim 10 wherein  
2       the light source is controlled to emit light in the blue  
3       spectrum.

1       Claim 17 (currently amended): The system of claim 16 wherein  
2       the light source is controlled to emit light at about 400 nm.

1       Claim 18 (original): The system of claim 10 wherein the shift  
2       in resonance of the microsphere is detectable by the detector

3 when any of the receptors in the belt surface area capture a  
4 single molecule having a mass of about 200,000 Da.

1 Claim 19 (original): For use in a system including a light  
2 source, and a light detector, for determining the presence or  
3 concentration of a substance in a medium, a sensor comprising:

- 4       a) at least one optical fiber;  
5       b) at least one microsphere, the at least one microsphere  
6           i) being coupled with the optical fiber,  
7           ii) having a surface including receptors for the  
8           substance, wherein the receptors are provided  
9           substantially at a belt surface area including an  
10          equator of the microsphere, and wherein surface areas  
11          of the microsphere other than the belt surface area  
12          are substantially free of receptors, each of the at  
13          least one optical carrier being coupled with the  
14          microsphere,

15               wherein, when light is applied to the optical  
16          fiber, a resonance within the microsphere is excited,

17               wherein, if the substance adsorbs to the  
18          receptors on the microsphere surface, a shift in the resonance  
19          occurs, and

20               wherein a presence or concentration of the  
21          substance can be determined based on the shift in resonance.

1 Claim 20 (original): The sensor of claim 19 wherein the  
2 substance is a protein, and  
3               wherein the receptors are complementary amines.

1 Claim 21 (original): The sensor of claim 19 wherein the  
2 substance is a virus particle, and wherein the receptors are  
3 complementary to the virus particle.

1 Claim 22 (original): The sensor of claim 19 wherein the  
2 substance is DNA, and

3                   wherein the receptors are complementary to the  
4   DNA.

1   Claim 23 (original): The sensor of claim 19 wherein the  
2   microsphere is formed of a material having an index of  
3   refraction in water of approximately 1.7.

1   Claim 24 (original): The sensor of claim 19 wherein the  
2   microsphere has a radius in a range of 3.6-10  $\mu$ m.

1   Claim 25 (original): The sensor of claim 19 wherein each of the  
2   at least one optical fibers of the sensor are optically coupled  
3   with the microsphere at the equator.

1   Claim 26 (original): The sensor of claim 19 wherein the  
2   microsphere is formed of amorphous sapphire.

Claims 27-36 (withdrawn)